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Abstract

A high power ultrasonic transducer is provided. In one embodiment, the transducer includes means for providing power in excess of three kilowatts. The transducer further includes an active element made from a magnetostrictive material and means for producing an electromagnetic field which extends through at least a portion of the active element. The active element is changeable between a first shape when in the absence of the electromagnetic field and a second shape when in the presence of the electromagnetic field. The transducer also includes means for providing an electrical signal to the means for producing an electromagnetic field and an acoustic element connected to the transducer for channeling ultrasonic energy to perform work. In one embodiment, an ultra-high power transducer is provided comprising a plurality of sub-motors, each containing an active element made from a smart material, wherein the sub-motors operate simultaneously to produce ultrasonic energy. The transducer in this embodiment further includes a cooling system connected to the transducers for cooling each active element, the cooling system utilizing a phase change medium. The transducer further includes a composite master wave-guide connected to the plurality of sub-motors, the master wave-guide reactive to the ultrasonic energy from the sub-motors, wherein the master wave-guide channels the ultrasonic energy to perform work.

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